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TRANSLATION 93 (T93)

DEPARTMENT OF MEDICAL ZOOLOGY
UNITED STATES
NAVAL MEDICAL RESEARCH UNIT NO. 3
c/o AMERICAN EMBASSY
CAIRO, EGYPT

TRANSLATION FROM RUSSIAN. SEMASHKO, L. I. (1961)* House and tree sparrows as carriers of ticks in Turkmenia¹. Part 2. Zool. Zh., 40(7):1070-1078.

At the end of 1955, we undertook the task of investigating the role played by sparrows as possible transporters of ectoparasites into populated areas.

In the southern and central regions of Turkmenia a total of 2,237 sparrows belonging to two species, and 21 nests were inspected. From these birds, 9,219 specimens of ectoparasites were collected; of them - 7,355 ticks, 59 fleas, 1,799 Mallophaga, and 7 bloodsucking flies (concerning fleas, see Zagniborodova and Semashko, 1960).

The list of tick species is presented in Table 1, where are also indicated (according to literature sources) the diseases which these ectoparasites may carry. From blood and various organs of sparrows we have isolated several cultures of pathogenic bacteria (typhus abdominalis, paratyphoid fever, Salmonella enteritis, Sonne's bacillus and Flexner's bacillus (dysentery) (Semashko and Stepanian, 1961).

Results of many years of tick collection from sparrows and the geographical location of collections are presented in Table 2.

* Ashkhabad Institute of Epidemiology and Hygiene.

¹ Reported at the Scientific Conference of Turkmenian Anti-Plague System on 1 February 1960. See Zool. Zh., 1959, 38(9):1383-1387 (NAMRU translation T90).

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In Turkmenia, tick-infestation of tree sparrows amounts to 50.0%, abundance index being 3.3; of house sparrows 33.2%, abundance index being 2.2. Fourteen species of ticks and mites are represented. (Table 1).

Some of the tick species were sufficiently discussed in the previous paper (Semashko, 1959).

ARGAS PERSICUS OTTN

Larvae and nymphs of ticks were found on sparrows in almost all areas under observation (Table 2). Their number on some birds reached 11 specimens (October, 1957), but more often only 2 or 4 specimens were found. Appearance of immature stage ticks is observed several times during the year, but two peaks stand out very clearly: spring (April-May) and spring-fall, which begins in the first ten days of August.

The role of sparrows in transport of these ticks is very great, especially in Poultry Raising Farms.

Sometimes even the most conscientious cleaning of the poultry farm and strict quarantine of poultry, very quickly comes to naught owing to maintenance of immature ticks A. persicus by sparrows, which are reintroduced by these birds into parasite-clean farms.

ARGAS REFLEXUS FABR.

In certain regions of the Republic, larvae of this tick were found everywhere on sparrows. In some populated localities they were the chief ectoparasites of sparrows, infesting the latter up to 59% (May-June 1957). Larvae of this tick were very often found on females, especially in the concha auricularae and abdominal areas, where their number reached 66 specimens.

If in addition to this, it is considered that among the human population in some small villages, repeated cases of Q fever were recorded, and that a strain of this disease was isolated from A. reflexus ticks (Zhmaeva, Pchelkina, and others 1955), then it is not difficult to understand the important role sparrows play in feeding A. reflexus larvae and in maintaining foci of this sickness. In other localities of the Republic, a similar picture was not observed. Here the ticks were not found at all, or if they were found they were in single numbers.

ORNITHODOROS TARTAKOVSKYI OL.

Only one larva and a nymph were found on house sparrows, which were killed (24 and 26 May 1957) in one of the small villages in Serakhss region. In all probability, the ticks crawled onto the birds in burrows where the sparrows nested.

ORNITHODOROS CONICEPS CAN.

Larvae of this tick were found (12 May 1958) on a female house sparrow, nesting in a burrow (in the environs of Ashkhabad).

IXODES sp. CREMULATUS group*

In abandoned wells near Ashkhabad, where in the spring of every year many thousands of migratory house sparrows from the South nest, I have found a great number of larvae, nymphs, and adult ticks Ixodes sp. (crenulatus group) (Table 2) on the birds. Checking the number of ticks on sparrows during the two seasons showed that the developmental cycle of these ticks is closely associated with the seasonal activity of sparrows, and therefore lasts one year.

In our preliminary report on this species, a hypothesis was expressed about a three-year cycle of development (Kerbabaev and Semashko, 1960).

* For review of Ixodes crenulatus group, see Filippova (1961) (HH).

The first hungry tick larvae begin to appear on house sparrows in April on the 3rd and 6th day after settling of migratory birds in wells. After a few days it is possible to find engorged larvae and nymphs on these birds.

In May the number of larvae gradually decreases, as most of them molt into nymphs. At the same time the numbers of adult ticks increase. In June, during the last month of nesting of sparrows, the ticks' developmental cycle approaches its end. Correlation of parasitizing stages changes still more in the direction of the final decrease of larval numbers and predominance of adult ticks molted from nymphs. The percentage of tick-infestation of sparrows drops sharply from 33.5 (in May) to 3.7.

At the time of sparrow migration (beginning of June) from their nesting places, these ticks almost completely abandon the birds, staying behind in their biotopes. Engorged and fertilized females soon begin to lay eggs, the development of which is delayed, in all probability, till the return of sparrows in spring of the following year.

It is possible that a certain small number of ectoparasites, most likely unfertilized females, are capable of remaining on the host for weeks waiting for the male (Balashov, 1957), and that they are transported by birds into other regions and even near the dwellings of man. Allowing such possibility, we still consider that these exceptional ticks from wells must very soon perish, not finding in dry regions of the Republic biotope conditions specific to them.

HAEMAPHYSALIS PUNCTATA CAN. and FANZ. and H. SULGATA
CAN. and FANZ.

Immature stages of the first and second species were found now and then on sparrows in spring-summer periods (May-June). All findings of these ticks were on house sparrows, which were nesting in burrows.

RHIPICYPHALUS SANGUINEUS LATR.

Only once we found a semi-engorged nymph of this tick on a house sparrow, killed in the environs of Ashkhabad (9 May 1958).

HYALOMMA PLUMBEUM PANZ.*

Immature ticks were found on sparrows in all provinces and districts of Turkmenia that were inspected by me. Their appearance was noted during summer-autumn months. Thus, in populated localities in mountainous regions, H. plumbeum begin to parasitize sparrows at the beginning of the 3rd decade in July, up to 48% of the birds were infested, abundance index being 1.6².

In the valley part of the Republic, the summer peak of parasitism was not noted. Usually it occurs in the second half of September and ends in the first ten days of October.

It is interesting that we did not find H. plumbeum ticks on sparrows, which we obtained beyond the limits of the outskirts of the town, where, it would seem, that they should have infested the birds in a greater degree, as observed in mountainous regions. The circumstance we are inclined to explain by decrease of cattle pasturing around the town, in connection with utilization of pasture grounds for garden cultures. Because of this, ticks concentrated more in cattle yards and farms, where also dwell a great number of sparrows, which serve as basic hosts of immature stages of H. plumbeum ticks within the boundary of the town.

DERMANYSSUS GALLINAE REDI.

This species more often parasitized in birds' nests, than on the bird itself, as these ticks are nest-burrow ectoparasites (Zemskaya, 1951).

It was not the aim of our work to study the fauna of ectoparasites of nests of sparrows, this is why ticks were collected only during examination of fledgelings. Although these mites were found on sparrows in most of the investigated regions, they were limited in number, not more than 3 or 4 specimens on one bird.

* Hyalomma marginatum (HH)

² Infestation of exoanthropic species of birds (partridges, thrushes, and bushchats), which we shot in pastures and roads for driving the cattle to and from the pastures, attained 50%, abundance index 3.6.

STEATONYSSUS VIATOR HIRST.

Like the previous species, this mite rarely parasitized adult sparrows, but was rather often found in nests which were built by house sparrows in burrows (Table 2).

THE ROLE OF SPARROWS AS HOSTS AND TRANSPORTERS OF VARIOUS TICKS

As was already communicated (Semashko, 1959) tree and house sparrows in Turkmenia are the most widespread and numerous bird-synanthropes.

This fact must be considered as one of greatest importance because as V. N. Ter-Vartanov, V. M. Gusev and others (1956) correctly write "..... in order to establish the importance of one or another species of birds in the active life of ticks, it is necessary to take into account not only the manner of living of birds, but, of no less importance, also their numbers in the investigated territory".

In the foothill-plains area near Ashkhabad, there are many wells of kyariz system. Their number exceeds 1000. According to our calculations in 1958, in each of these wells there were approximately from 30 to 100 and even up to 300 nests of house sparrows. Counting an average of 50 nests to a well, allowing 2 adult birds to each nest, we obtain for 1000 wells 100 thousand nesting sparrows. In each of the inspected nests there were 5 or 6 fledgelings. If we assume that only 4 fledgelings will live, we obtain a figure of 200 thousand fledgelings. Thus, in investigated territory absolute number of these birds was approximately 300 thousand. Considering only adult sparrows, it is possible to calculate the number of ixodid ticks parasitizing them during the first 2 months of nesting. In April, infestation in the indicated plain was 33% at abundance index 7.4 ticks to a bird. Therefore, during the first month approximately 2,466,600 ticks fed on adult sparrows.

In May, at infectivity rate of 33% of sparrows (index 1.2), approximately 400 thousand ticks fed³. But the last figure refers

³ The sharp decrease of the index in May depends, in all probability, on the appearance of fledgelings in the nests, this is why a considerable proportion of ectoparasites stops parasitizing adult birds and attacks the fledgelings.

only to adult birds. In May, the number of birds increases to 30,000 and even more (appearance of fledgelings).

If at the same time we should consider that the decrease of the index from 7.4 to 1.2 occurred owing to the appearance of fledgelings, then 6.2 ectoparasites from each adult sparrow began to feed on fledgelings in the nests starting from May. Thus the total percentage is allowed to reach 33%, and we shall still obtain approximately 4,133,000 ticks that fed on fledgelings. The sum of all the figures provides a result that is almost equal to 7 million ticks, which are fed by numerous sparrows in one small plain only.

True, it is possible to arrive at another conclusion, by admitting that the April figures of 2,466,600 are primordial, and that all the following figures were obtained owing to repeated blood-sucking of nymphs molted from larvae and of nymphs molted into adults. Having considered this possibility, we have once more confirmed the enormous importance of sparrows in feeding and in development of immature stages of ticks.

We have cited here our computations in establishing the potential of Ixodes sp. in one of the biotopes.

A similar picture is also observed among several other species of ticks which may be carriers of various diseases of man and farm animals (Table 1).

Thus, for example, in some populated localities of the Republic, A. reilexus ticks also attack human beings (Pavlovsky, 1948), and pass their development almost entirely on house and tree sparrows, as few other species of birds are present.

The same may be said about H. plumbeum ticks, which, for example, within the limits of Ashkhabad have found the possibility to develop on sparrows and to extend their places of habitat. As we have already noted, larvae and nymphs of these ticks were found on every second sparrow (51%) during the period of the autumnal peak.

The role of birds in relation to A. persicus ticks is extremely important, as many authors in different places have found larvae and nymphs of these ticks on sparrows and in their nests (Pobedonostsev, 1940; Mulyaraskaya, 1953; Ter-Vartanov, V.; Gusev and others, 1956; Semashko, 1959).

Tree sparrows are infested by D. passerinus and Pterygosoma mites the whole year round (Semashko, 1959). According to A. A. Zemskaya and A. I. Il'enko (1958), D. passerinus is also capable of reproduction on the body of sparrows. Because of this, these ectoparasites are very quickly transported by sparrows into their nests during the period of settlement of sparrows in new buildings of man.

Here is an appropriate place to mention the so-called accidental and rare findings of such species of ticks as Ornithodoros tartakovskyi Ol., Rhipicephalus sanguineus Lat., Ornithodoros coniceps Can. and Haemaphysalis punctata Can. and Fanz. In fact, their larvae and nymphs were found on sparrows not more than two or three times. At first glance it may seem that their parasitism on sparrows is not characteristic, especially for O. tartakovskyi which, according to literature data, had not been found on birds before. In other words, it should have been considered that these ectoparasites somewhere have accidentally crawled onto the sparrows which we were able to obtain. But it is more probable that this is not so. In the first place, many sparrows nestle on the ground and in burrows, which are often very near to the burrows of rodents and sometimes are even connected with them. Therefore, penetration of various ticks into the nests cannot be considered as accidental. One of the already existing confirmations of this (it is true, not in Turkmenistan) is the finding of immature stages of Rh. sanguineus and H. punctata on sparrows (Ter-Vartanov, Gusev, and others, 1956).

Thus, larvae and nymphs of the four above mentioned species of ticks cannot be considered as accidental findings on sparrows in Turkmenia, on the strength of a great number of these birds and their numerous contacts with human habitations and also with wild nature.

Of great importance in the life of ticks and mites which feed on birds and in their nests (D. gallinae, S. viator and others), are fledgelings of sparrows, which in Turkmenia without a doubt must feed a large group of arthropods, especially in the nests, which are built in burrows.

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Table 1

Species composition of ticks, collected from house and tree sparrows in Turkmenia.

Stages of ticks	Species	Family	Established and possible pathogenetic importance*
Larvae and nymphs	<u>Argas persicus</u> Oken, 1818	Argasidae	Fowl spirochetosis; Siberian plague; <i>Aegyptianella pullorum</i> ; Grahamellosis; Asiatic fowl plague; Equine encephalomyelitis; Tick-borne recurrent typhus; Fowl plague; Exanthematous fever; Brucellosis; Tick paralysis of fowl.
Larvae	<u>A. reflexus</u> Fabr., 1794	Argasidae	Q fever; Fowl spirochetosis.
Larvae and nymphs	<u>Ornithodoros tartakovskyi</u> Olenev, 1931	Argasidae	Tick-borne recurrent typhus; Leptospirosis; Human plague; Tularemia; Encephalomyelitis.
Larvae	<u>O. coniceps</u> Can., 1890	Argasidae	Importance not sufficiently studied.
Larva, nymphs and adults	<u>Ixodes</u> sp. group <u>crenulatus</u> **	Ixodidae	Importance not sufficiently studied.
Nymphs	<u>Haemaphysalis punctata</u> Can. and Fanz., 1877	Ixodidae	Tularemia; Piroplasmosis of big horned cattle; Brucellosis of sheep; Tick-borne exanthematous fever; Tick paralysis of sheep.
Larvae and nymphs	<u>H. sulcata</u> Can. and Fanz., 1877	Ixodidae	Brucellosis; Piroplasmosis of sheep; Necrobacillosis of farm animals.

* In drawing up the list literature data was made use of.

** ? Ixodes plumbeus (HH)

Table 1 (continuation)

Nymphs	<u>Rhipicephalus sanguineus</u> Latr., 1806	Ixodidae	Marseilles fever; Brucellosis; Tick-borne recurrent typhus; Tularemia; Hydrophobia; Hemosporidiosis of big horned cattle; Leptospirosis; Piroplasmosis of dogs; Haemogregarinosis and Filariasis of dogs.
Larvae and nymphs	<u>Hyalomma plumbeum</u> Panzer, 1795	Ixodidae	Human plague; Nuttalliosis and piroplasmosis of horses; Theileriosis and Gonderiosis of big horned cattle; Brucellosis of sheep; Crimean hemorrhagic fever; Tularemia; Babesiosis of sheep; Q fever.
Nymphs and adults	<u>Dermanyssus passerinus</u> Berl. and Treus.	Dermanyssidae	Q fever
Nymphs and adults	<u>D. gallinae</u> Redi, 1674	Dermanyssidae	Q fever; Encephalomyelitis.
Nymphs and adults	<u>Steatonyssus viator</u> Hirst 1921	Liponyssida	Q fever
Larvae	<u>Trombicula</u> sp.	Trombiculidae	Importance not sufficiently studied.
Nymphs and adults	<u>Pterygosoma</u> sp.	Trombiculidae	Importance not sufficiently studied.

Table 2

Years	Investigated regions	Number of obtained sparrows	Infested	Total	Collected ticks among them										D. pallinae	Steatonyssus viator	Trombicula sp.	Pterygossoma sp.	% of infection	Abundance index
					Argas persicus	I. reflexus	Ornithodoros tartakovskyi	O. coniceps	Ixodes sp. or crenulatus group	Haemaphysalis punctata	H. sulcata	Rhipicephalus sanguineus	Hyalomma plumbeum	Dermanyssus passerinus						
1955	Marysk reg., Vekil-Bazar, Iolotan and other points	73*	46	94	6	-	-	-	-	-	-	-	2	47	-	-	2	37	63.0	1.3
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		274	165	1206	4	-	-	-	-	-	-	-	5	443	-	-	51	703	60.2	4.4
1956	shkhabad	62	25	61	13	-	-	-	-	-	-	-	-	26	-	-	-	18	40.3	1.0
		138	84	117	23	-	-	-	-	-	-	-	6	60	-	-	-	19	61.0	0.85
		6	1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1957	shkhabad	516	293	2079	36	3	-	-	-	-	-	-	49	976	-	-	-	1015	56.8	4.0
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		124	45	954	2	160	-	-	-	-	-	-	4	51(715)	14	3	-	8	36.3	1.9
	Seral haky region	104	43	335	11	273	2	-	-	-	-	-	-	45	-	-	-	4	41.3	3.2

1958	Ashkhabad and its environs	305	91	404	114	-	-	-	-	1	1	-	-	64	216	-	-	-	108	29.8	1.3
		117	59	531	12	-	-	3	159	2	9	1	2	25(318)	-	-	-	-	-	33.3	1.2
	Mountain region of Kopet-Dag, village Ger-mab and others	46	25	97	29	4	-	-	-	-	-	-	-	-	38	2	4	20	54.0	2.0	
		55	19	62	5	-	-	-	-	-	-	-	-	34	16	-	-	-	7	34.5	1.1
1959	Environs of Ashkhabad	3	2	20	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-
		129	30	206	13	3	-	-	-	164	-	2	-	-	10	3	11	-	-	23.3	1.6
	Tedzhensky region	47	8	16	-	-	-	-	-	-	-	-	-	16	-	-	-	-	-	17.0	0.34
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	1526	759	4987	114	167	-	-	-	1	1	-	-	146	2566	22	7	53	1910	50.0	3.3
	Number of examined fledglings	533 (93**)	177	1198	57	276	2	3	323	2	11	1	36	440	-	3	15	-	29	33.2	2.2
		20	15	56	-	-	-	-	-	-	-	-	-	-	56	-	-	-	-	75.0	2.8
		65	28	1114	-	2	-	-	-	11	-	-	-	-	18	27	1056	-	-	43.0	17.0
	Larvae				156	445	1	3	186	-	6	-	98	-	-	-	-	53			
	Nymphs				15	-	1	-	104	3	5	1	84	1103	-	14	292	-	-	-	-
	Males				-	-	-	-	42	-	-	-	-	1444	-	38	651	-	-	-	-
	Females				-	-	-	-	3	-	-	-	-	534	-	-	135	-	-	-	-

* Data in the numerator refers to tree sparrows, in the denominator to house sparrows.

** Figures in parentheses for exceptional cases.